KuraStone™

Product Test Summaries

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Certifications:

For a copy of complete testing and certification documentation,
please call Nichiha Technical Department toll free at 1.866.424.4421.

NICHIHA
fiber cement

ASTM C 1185 Physical Properties Tests

Date Of Test: February 2005

Test Agency: Resources, Applications, Designs and Controls, Inc. Listing and Testing Division
3220 E. 59th Street, Long Beach, CA 90805

Test Method: ASTM C 1185 Durability tests including linear variations with change in moisture content, water tightness, wet flexural strength, freeze/thaw, warm water, and heat/rain.

Test Specimen: Nichiha KuraStone™ Fiber Cement Panels

Specimen *Thickness:* 35mm (nominal 1 3/8").

Specifications: *Width:* Various.
Length: Various.

Test Procedure: The test was performed in accordance to ASTM requirements.

Test Results: The test results show the Nichiha Brick, Stone & Block Fiber Cement Panels successfully comply with the requirements specified in ICC-ES.

Property	Test Result	Requirement	Pass/Fail
Moisture Content, %	3.86%	Report value	Report value
Density, lb/ft^3	104.7 lb/ft^3	Report value	Report value
Flexural Strength (machine direction) Dry, psi Wet, psi Freeze/Thaw Warm Water	1065.9 psi	 580 580	 Pass Pass
Water Tightness	No drop formation observed	No drop formation	Pass
Warm Water Resistance	No signs of cracks, delaminations, no loss of flexural strength on any samples tested.	No visible cracks or structural alteration	Pass
Heat/Rain Resistance	No signs of cracks, damage or structural failure after 25 cycles.	No visible cracks or structural alteration	Pass

ASTM E 84 Surface Burning Characteristics

Date Of Test: November 18, 2004

Test Agency: Omega Point Laboratories for RADCO
Long Beach, CA

Test Method: ASTM E 84 Standard test method for surface burning characteristics of building materials, sometimes referred to as the Steiner Tunnel test.

Test Specimen: Nichiha Brick, Stone & Block Fiber Cement Panels

Specimen Specifications: *Thickness:* 18mm (nominal 3/4").
Width: 455mm (nominal 18").
Length: 610mm (nominal 2').

Test Procedure: The panels were physically self-supporting and required no additional sample preparation. A total of 16 panels, each measuring 18 inches in width and 2 feet in length were placed end-to-end on the ledges of the tunnel furnace to mark up the 24 foot test sample. Testing was performed in accordance with ASTM.

Test Results: *Flame Spread Index*

• The maximum distance the flame spreads along the length of the sample from the end of the igniting flame is determined by observation.

• The Flame Spread Index (FSI) of the material is determined by rounding by Calculated Fame Spread (CFS) as described in UL 723. The CFS is derived by calculating the area under the flame spread distance (ft.) versus time (min.) curve, ignoring any flame front recession, and using one of the calculation methods as described below.

- If the total area (At) is less than or equal than 97.5 min.-ft., the CFS shall be 0.515 times the total area. (FSI=0.515 AT).
- If the total area (At) is greater than 97.5 min.-ft., the CFS is to be 4900 divided by 195 minutes the total area. (FSI=4900/(195-At)).

Test Sample	Maximum Flame Spread (ft.)	Time of Maximum Flame Spread (min.)	FSI
KuraStone™	0.0	-	0

Test Results: *Smoke Developed Index*

• The Smoke Developed Index is determined by rounding the Calculated Smoke Developed (CSD) as described in UL 723. The CSD is determined by the output of a photoelectric circuit operating across the furnace flue pipe. A curve is developed by plotting values of light absorption (decreased in cell output) against time. The CSD is derived by expressing the net area under the curve for this material as a percentage of the net area under the curve for untreated red oak.

- The CSD is expressed as: CSD = (Am/Aros) x 100.
  - Am: The area under the curve for the test material.
  - Aros: The area under the curve for untreated red oak.

Test Sample	SDI
KuraStone™	0

ASTM E 330 Negative Transverse Load Test - 2x4 Wood Frame, 16" o.c. - Plywood Sheathing

Date Of Test: October, 2009

Test Agency: Progressive Engineering, Inc.
58640 State Road 15
Goshen, IN 46528

Test Method: ASTM E 330 Standard test method for structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.

Test Specimen: KuraStone™ Panels

Specimen Specifications: *Thickness:* 35mm (nominal 1-3/8")
Width: 150mm (nominal 6")
Length: varies - 260mm, 390mm, 650mm (nominal 10-1/4", 15-3/8", 25-5/8")

Test Panel Structure: *Support Frame:* 4 feet (1,219mm) in width x 4 feet (1,219mm) in height frames were constructed from 2x4 nominal stud grade (38mm x 76mm) Spruce-Pine-Fir (SPF) placed on 16" o.c.
Frame Cover (Sheathing): 15/32" plywood (4-ply)
Nichiha Panel: Each panel was fastened using Nichiha short clips (JE 602) at each joint.

Test Procedure:

- The panels were tested in the negative direction.
- 2 mil plastic sheeting was loosely draped over the wall frame. A 3"-4" fold was located in each stud bay. A second fold was placed in the center of each siding course to insure uniform contact on the back of each KuraStone™ panel.
- A test specimen was placed in a test fixture with the KuraStone™ side down. The bearing supports were set 48" apart, such that the cleats rested on the supports, at each end of the wall. The edges of the polyethylene sheeting that was placed between the wall frame and the KuraStone™ during construction were taped to the test fixture. See attached fixture drawings for details.
- A uniform pre-load of 80 PSF was applied to the test specimen for 10 seconds. The pressure difference was released across the specimen and allowed to recover for one minute. A pressure difference was then applied across the specimen in increments of 20 PSF, holding for a minimum of 30 seconds before increasing 20 PSF. The test was continued until a failure occurred. Visual observations were recorded at each increment and the maximum pressure was captured by the data acquisition system.

The above testing was conducted on two (2) additional specimens.

Note: Periodically during the testing, a water manometer was used as a secondary verification device.

Test Procedure: The ulimate loads achieved in each panel and the allowable load is shown below.

	Negative Load	
Test Sample	**Ultimate Load (psf)**	**Allowable Load (psf)**
1	179	59.67
2	186	62
3	170	56.67
Average	178	59.3

ASTM E 331 Water Penetration Test

Date Of Test: May, 2004

Test Agency: RADCO Resources, Applications, Designs and Controls
3220 E. 59th Street
Long Beach, CA 90805

Test Method: ASTM E 331 Standard test method for water penetration of exterior windows, curtain walls, and doors by uniform static air pressure difference.

Test Specimen: KuraStone™

Specimen Specifications:
Thickness: 35mm (nominal 1- 3/8")
Width: 150mm (nominal 6")
Length: varies - 260mm, 390mm, 650mm (nominal 10-1/4", 15-3/8", 25-5/8")

Test Structure:
- The test specimen was 4ft x 8ft (1.22m x 2.44 m) and constructed using nominal 2 x 4 stud grade Spruce-Pine-Fir (SPF) lumber at 16" (406.4mm) on center.
- The sheathing was 7/16" (11.1mm) Exposure 1, APA rated, Oriented Strand Board (OSB) secured with 6d common nails at 12" (304.8mm) on center. The OSB was divided into three pieces: one (1) 4ft x 4ft (1.22m x 1.22m), one (1) 4ft x 2ft 8in. (1.22m x .813m), and one (1) 4ft x 1ft 4in (1.22m x .406m). This provides one horizontal joint and one vertical joint as required by ASTM E331.
- A layer of #15 Asphalt Felt Building Paper was applied over the OSB and secured with staples at 12" (304.8) on center in the field and on the perimeter.
- The first course of the KuraStone™ panels was secured to the panel using a starter track (JF7000). Further courses were fixed to the specimen with JE603 short clips and the provided screws. See the drawings and photos in the appendixes for further details.

Test Procedure:
- ASTM E331-00, "Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference" was conducted as described below:

  The water penetration test was conducted in a chamber designed to test two (2) 4ft x 8ft (1.22m x 2.44 m) panels or one (1) 8ft x 8ft (2.44m x 2.44m) panel. The water spray system consisted of a grid of spray nozzles and was calibrated prior to conducting the test to assure that it delivered a uniform spray of water to the exterior face of the test specimens at a minimum rate of 5.0 US gal./ft^2*hr (3.4 L/m^2*min). The negative pressure was achieved by evacuating the air inside the test chamber using a vacuum pump.

- Three (3) 4ft x 8ft (1.22m x 2.44m) panels were tested. The panels were mounted in the test chamber with the exterior faces facing the water spray and interior face facing the pressure chamber. The outside perimeter of the panels were sealed with silicone and a 3/8" (9.5mm) rubber gasket to create a water and air tight seal. The abutting sides of the panel were also sealed with silicone on the outer surface.

Water Penetration
The panels were subjected to a uniform water spray at a minimum rate of 5.0 gallons per square foot per hour (3.4 L/m^2*min), and a simultaneously applied pressure differential on the panel surface of 0.55 in. H_2O of water column pressure (2.86 psf) (136.9 Pa). The water spray and pressure was maintained on the panels for 15 minutes during which time the interior surface was constantly monitored for water penetration. The test was conducted at RADCO's Long Beach, CA test facility on May 11, 2004.

Test Results: Water may pass through butt joints, but not 15 lb. felt building paper.